

FEDERAL AVIATION AGENCY SPECIFICATION

POWER COMBINER, 48 VOLTS DC

1. SCOPE

1.1 Scope.- The equipment covered by this specification consists of a 5 to 15 ampere 48 volt dc power combiner with diode-isolated mixer, and a visual-aural alarm to indicate loss of dc from any of the input sources, fabricated on a rack-panel-chassis assembly; also a separate wall-mounting auxiliary alarm assembly. This equipment is designed to combine two to four external power supplies (each 48 volts dc, 5 to 15 amperes) to provide continuity of service in the event of failure of any one power supply.

2. APPLICABLE SPECIFICATIONS

2.1 Specification issue.- The following specifications of issue as of the date of the IFB for advertised procurements, or date of contract for negotiated procurements, form a part of this specification.

2.1.1 FAA specifications.-

FAA-R-638      Instruction Books, Electronic Equipment

FAA-R-777      Electronic Equipment, General Specification

(Copies of this specification, and of other applicable FAA specifications and drawings, may be obtained from Federal Aviation Agency, Washington, D. C. 20553, ATTN: Contracting Officer. Requests should fully identify material desired, i.e. specification numbers, dates, amendment numbers, complete drawing numbers; also request should state the contract involved or other use to be made of the requested material.)

2.1.2 Military specifications.-

MIL-STD-275    Printed Wiring for Electronic Equipment

(Information on obtaining copies of Military specifications is given in the FAA Index of Military Specifications, 2.4 of FAA-R-777.)

### 3. REQUIREMENTS

3.1 Equipment to be furnished by the Contractor.- Each equipment furnished by the Contractor shall be complete in accordance with all specification requirements. Instruction books shall be furnished in accordance with FAA-R-638. In addition, auxiliary alarm units shall be provided as required by the contract schedule.

#### 3.2 Definitions

3.2.1 Normal operating conditions.- The term "normal operating conditions" is defined as any value of temperature, voltage and frequency within the limits specified below and is the range of values over which these parameters may vary during the course of a test.

Temperature	$30^{\circ}\text{C.} + 10^{\circ}\text{C.}$
AC line voltage	$120\text{v} + 5\text{v}$
AC line frequency	$60 + 1 \text{ cps}$
DC input voltage	$48 + 2 \text{ vdc}$

3.2.2 Service conditions.- The term "service conditions" is defined as follows:

Temperature	$-10^{\circ}\text{C. to } +60^{\circ}\text{C.}$
Humidity	$0 \text{ to } 95 + 5\%*$
AC line voltage	$105\text{v to } 130\text{v}$
AC line frequency	$60 + 1 \text{ cps}$
DC input voltage	$48 + 4 \text{ vdc}$
Duty	Continuous, unattended

\*Under test conditions the relative humidity shall be at least 90% but at the option of the Contractor may be any values in the range 90% to 100%; however, all specification requirements shall be met at the relative humidity values within the 90% to 100% range which the Contractor provides in conducting the tests.

3.2.3 Et seq.- The abbreviation "et seq" shall mean, "and the following subparagraphs (subordinate to the cited paragraph)."

3.3 Performance.- Performance shall meet the requirements of the following subparagraphs over the range of service conditions. General circuit arrangement shall follow the block diagram of Figure 2. Loss of up to half the input supply power shall not affect the output in any way.

3.3.1 Input combining.- Four input terminal pairs to permit combining of  $48 + 4 \text{ vdc}$  similar (each having the same current rating) input power supplies with output ratings of up to 15 amperes in a diode isolation system shall be furnished with the negative side common. The voltage drop through the isolation system shall be not greater than 1 vdc at 15 a loading regardless of the inputs connected.

3.3.2 Input isolation.- Each input shall be isolated against loading of other inputs when a short circuit occurs at that input. Isolation shall permit not more than 5 ma back current from the output bus to any shorted input terminals.

3.3.3 Output.- Power capability of the common output circuit wiring shall be not less than 30 amperes continuously at a nominal 48 vdc from three fused output terminal pairs. Wiring of each fused output circuit shall be capable of handling not less than 10 amperes continuously.

3.4 Alarm system.- The alarm system shall provide performance specified in the following subparagraphs over the range of service conditions. A continuous 24-hour alarm condition shall not injure any component.

3.4.1 Visual alarm.- The lampholder shall be fitted with a red lens. This lamp shall provide alarm illumination and shall also be actuated as defined in 3.4.3.

3.4.2 Aural alarm.- The aural alarm shall be derived from a device mounted to provide not less than 90 db nor more than 110 db SPL re 0.0002 microbar of sound at a distance of 3 feet from the front of the panel.

3.4.3 Alarm silencing.- A switch shall be mounted on the front panel with which the aural alarm signal may be silenced. This switch shall be wired so that, in its silencing position, the visual alarm lamp is illumined whether or not an alarm exists. Operation of this switch shall in no way affect the auxiliary alarm assembly.

3.4.4 Input alarm.- Loss of voltage at any input terminal pair shall be indicated by loss of illumination of an amber-lensed lamp wired across that terminal pair (3.4.5).

3.4.5 Low voltage.- Any input terminal pair voltage which is lower than the output voltage by not less than  $10 \pm 1$  vdc shall actuate the alarm system. A protective device such as a series lamp may be used to limit peak relay coil current.

3.4.6 Fuse alarm.- Any current from 30 ma through 120 ma at 48 v dc through a current limiting resistor (Figure 3), applied to the fuse alarm terminals shall actuate the alarm system. Overload of any component shall not occur over this range of inputs. A zener diode shall be used at the fuse alarm terminals to limit voltage to a range from 20 to 26 vdc.

3.4.7 Output alarm.- A short circuit across any output terminal pair shall cause its corresponding fuse to blow before any damage to components or wiring can occur. An indicating fuseholder shall be provided for each output. The free end of the indicating lamps shall be connected to actuate the fuse alarm relay.

3.4.8 Power.- Alarm system power shall be 46 vac derived from the 120 vac 60 cps supply lines. A transformer shall be used to isolate the alarm system from the supply line. Isolation shall be not less than 1 megohm.

3.5 Lamps.- The indicator and alarm lamps shall be 48 v 30 ma rating telephone slide-base extended life type such as Western Electric type 2Y or General Electric type 48 c; an exception to FAA-R-777.

3.6 Lampholders.- Lampholders shall be of the finger-tip removal type and shall require no tools for lamp removal or insertion. The light output shall be plainly visible over a hemispherical field in front of the panel. Lenses shall be of the internal pressure-fitted type, internally frosted.

3.7 Semiconductors.- All active elements, diodes, and rectifiers shall be silicon semiconductor types.

3.8 Construction.- The equipment specified herein shall be constructed on a standard aluminum rack panel, Size "C," using a vertical chassis. A panel door shall not be used.

3.8.1 Panel layout.- The panel shall be arranged in accordance with Figure 1 and the following subparagraphs. Each group shall be so spaced as to set it apart as a group. Each group shall be clearly labelled.

3.8.1.1 Panel marking.- All panel markings shall be done with 1/8 inch Gothic block lettering.

3.8.1.2 Nameplate.- A standard FAA nameplate shall be laterally centered near the bottom of the front panel. It shall be entitled, "POWER COMBINER, 48 V DC".

3.8.1.3 Card holders.- Card holders, 15/32 inch by 7/16 inch wide, shall be mounted immediate to each output fuse and each input indicator lamp and shall be Marine View Electronics, Inc., 88 Van Wyck Blvd., Jamaica, New York, or equal. Card holders shall include replaceable white cards and plastic covers which shall require no tools for card replacement.

3.8.2 Rear chassis layout.- The rear chassis layout shall be arranged as provided by the following subparagraphs. Transformer, relays, and other components shall be neatly and firmly mounted above and between the terminal strips.

3.8.2.1 Terminal strip.- Two barrier terminal strips, Howard B. Jones type 150Y, or equal, shall be mounted at the lower left and the lower right edges of the vertical portion of the vertically-mounted chassis in groups of eight terminals each.

3.8.2.2 Marker strips.- White marker strips shall be mounted under the terminal strips with the identified edges uppermost.

3.8.2.3 Terminal identification.- Terminals shall be identified for polarity. Terminal pairs shall be identified by number under groupings as follows:

Group identification

Terminal pairs

Input	1 thru 4 (input)
Output	1 thru 3 (output)
Fuse alarm	4 only

3.8.2.4 Auxiliary alarm connector.- A connector for an auxiliary alarm shall be mounted between the terminal strips near the lower rear edge of the chassis. A mating connector equipped for cable strain relief shall be furnished.

3.9 Auxiliary alarm assembly.- When required by the contract schedule, an auxiliary alarm assembly shall be furnished in accordance with the following subparagraphs.

3.9.1 Size.- Overall size of the auxiliary alarm assembly shall be not larger than 5 inches by 4 inches by 4 inches.

3.9.2 Mounting.- The auxiliary alarm assembly shall be arranged for wall mounting with a standard 3/4 inch knock-out in each 4 x 4 inch end.

3.9.3 Electrical connections.- The electrical connections, for the auxiliary alarm assembly shall be made through a four-terminal barrier-type terminal strip with marker strips mounted to provide identification of connections.

3.9.4 Components.- Components shall be those used in the main assembly alarm system, employing (1) a visual alarm lamp; (2) an aural alarm; and (3) an alarm silence switch arranged to leave the visual alarm lamp on when the aural alarm is silenced (3.7.3).

3.9.5 Nameplate.- The nameplate may be side-mounted and shall be titled "AUXILIARY DC ALARM " .

4. SAMPLING, INSPECTION, AND TEST PROCEDURES

4.1 General.- See Section 4 of Specification FAA-R-777 for classification of tests, meaning of reference symbols for tests, and general methods of sampling and inspection.

4.2 Tests, service conditions.- The tests listed in the following tabulation shall be conducted while subjecting the equipment to the test procedure described in FAA-R-777. Each test shall be conducted at the upper, nominal, and lower limit of both ac and dc supply voltages.

**Input combining efficiency	3.3.1
Input isolation	3.3.2
**Output	3.3.3
**Alarm system	3.4
**Aural alarm	3.4.2
Low voltage	3.4.5

Fuse alarm	3.4.6
**Output alarm	3.4.7
**Power supply	3.4.8

4.3 Tests, normal conditions.- The tests listed in the following tabulation shall be conducted under normal operating conditions.

*Input isolation	3.3.2
*Input alarm	3.4.4, 3.4.5, 4.6
*Alarm lamp	3.4.1, 4.6
*Alarm silencing	3.4.3, 4.6
*DC fuse alarm	3.4.6, 4.6
*Auxiliary alarm assembly	3.9 et seq, 4.6, 4.7

4.4 Input power supplies.- All input power supplies used during test shall be 48 vdc units rated at not less than 15 amperes capable of adjustment over the range 44 vdc to 52 vdc. Hum and noise shall be limited to  $\pm 2$  v peak.

4.5 Loads.- Loads shall be divided into three equal parts, each designed to demand 10 amperes at 48 vdc, applied to the three output terminal pairs separately but simultaneously.

4.6 Production alarm system tests.- Each unit shall be tested to insure proper alarm operation. Production tests of the alarm system shall include fuse failure tests based on Figure 3.

4.7 Auxiliary alarm assembly.- Auxiliary alarm assemblies shall be plugged into the connector called for under 3.8.2.4 on a power combiner which has been previously tested. They shall show alarm conditions similar to those required of the main alarm system when the alarm system is actuated.

## 5. PREPARATION FOR DELIVERY

5.1 General.- See FAA-R-1030.

5.2 Individual packing.- Where two or more units are packed in a common shipping container, each unit with its accessories shall be packed and marked so that it can be identified and reshipped individually without repacking.

## 6. NOTES

6.1 Intended use.- This equipment will provide fully automatic changeover of power source when any one input supply fails. Suggested arrangements for regular use are:

<u>Input</u>	<u>Output (max.)</u>
a. 2 each, 5a supplies	5a
b. 4 each, 5a supplies	10a
c. 2 each, 15a supplies	15a
d. 4 each, 15a supplies	15a

Output fuse values must be determined by installation requirements and cards for cardholders will reflect these values.

6.2 Note on information items.- The subparagraphs listed below are only for the information of the Contracting Officer, intended to assist him in formulating a contract. They are not contract requirements, nor binding on either the Government or the Contractor, except to the extent that they may be specified elsewhere in the contract as such. Any reliance placed by the Contractor on the information in these paragraphs is wholly at the Contractor's own risk.

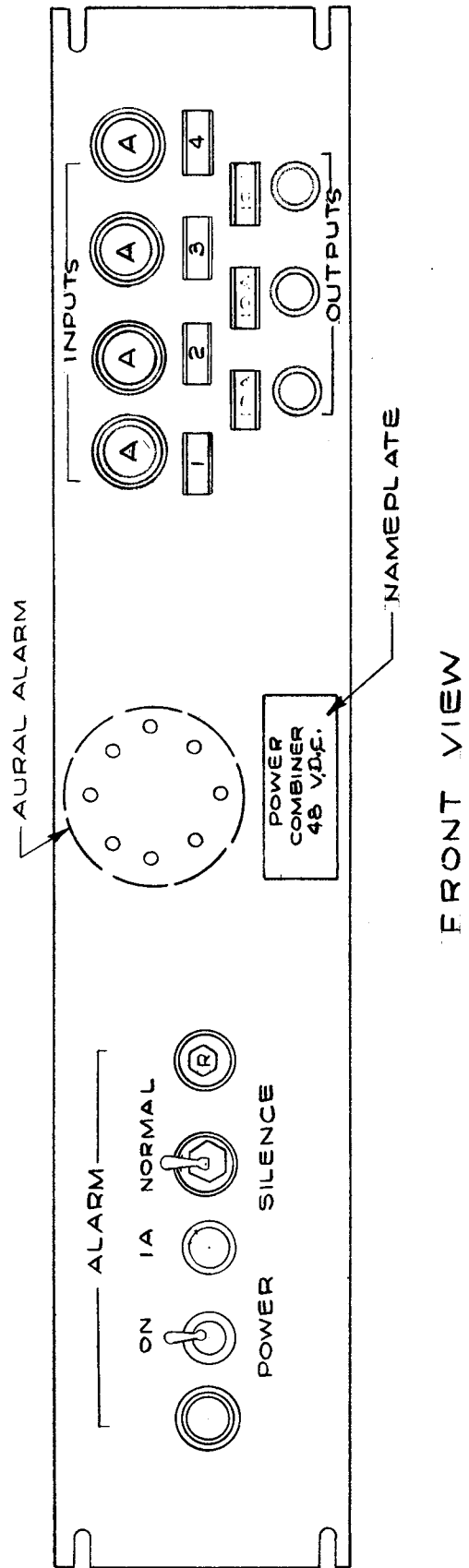
6.2.1 Quantities.- Inasmuch as this specification covers two items equipment, it will be necessary that the contract schedule specify the number of each item to be delivered:

- Item 1 Power combiner, 48 VDC
- Item 2 Auxiliary alarm assembly

6.2.2 Approval of layout and circuitry.- The contract schedule should contain a requirement that the Contractor submit 3 copies of his proposed layout and circuitry to the Contracting Officer for approval before proceeding with production, such approval to be based on determination of compliance with FAA-R-777 and with paragraphs 3.3 through 3.18 and Figures 1 and 2 of this specification. The stipulation should provide for an allowance of ten days, after receipt by the Government of each submission (or resubmission), before approval, comments, or requests for resubmission, will be mailed to the Contractor by the Government.

\* \* \* \* \*

FOR FIGURES 1 TO 3 SEE PAGES 8, 9, and 10



FRONT VIEW

FIG. 1.



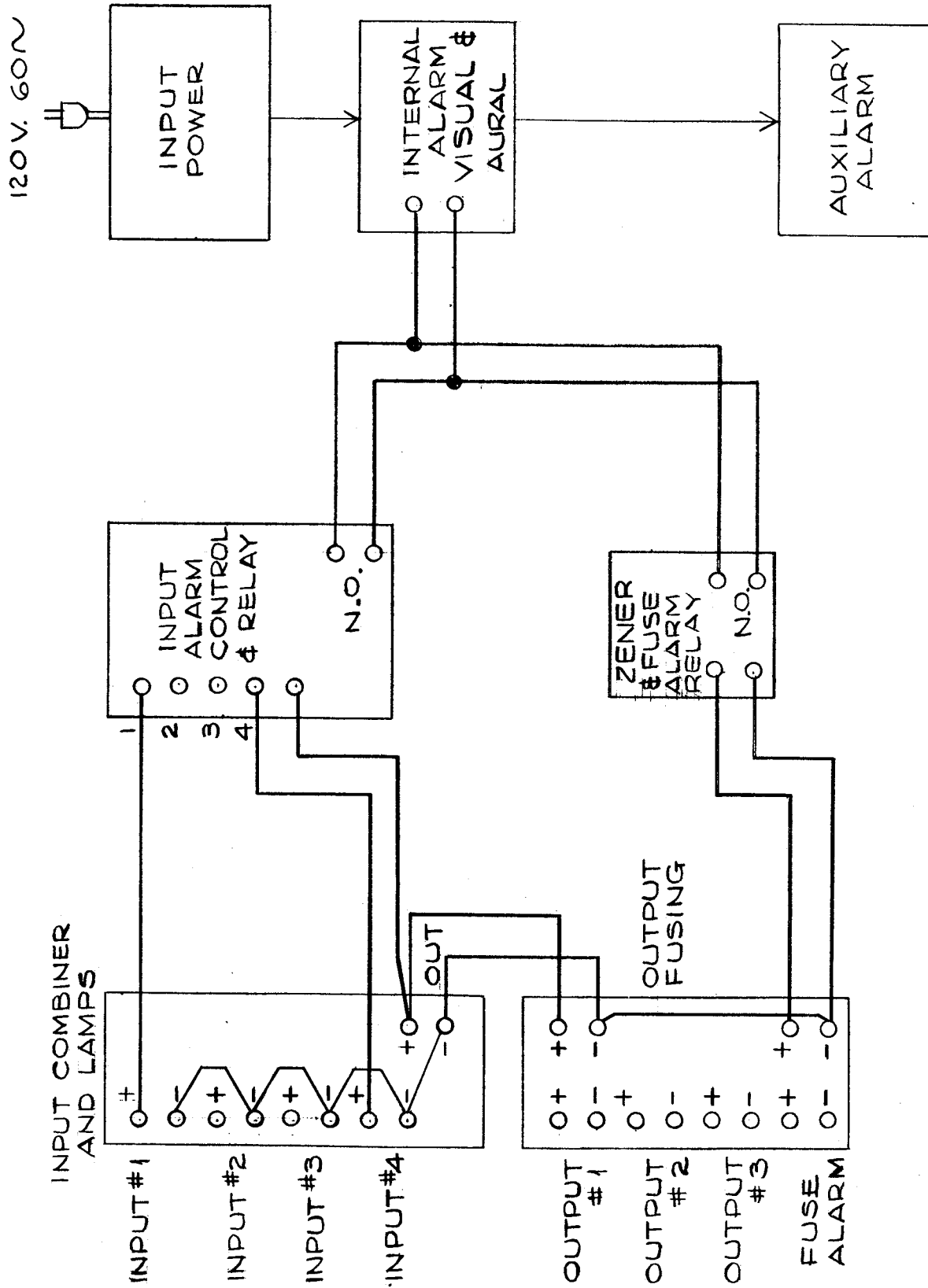


FIG. 2

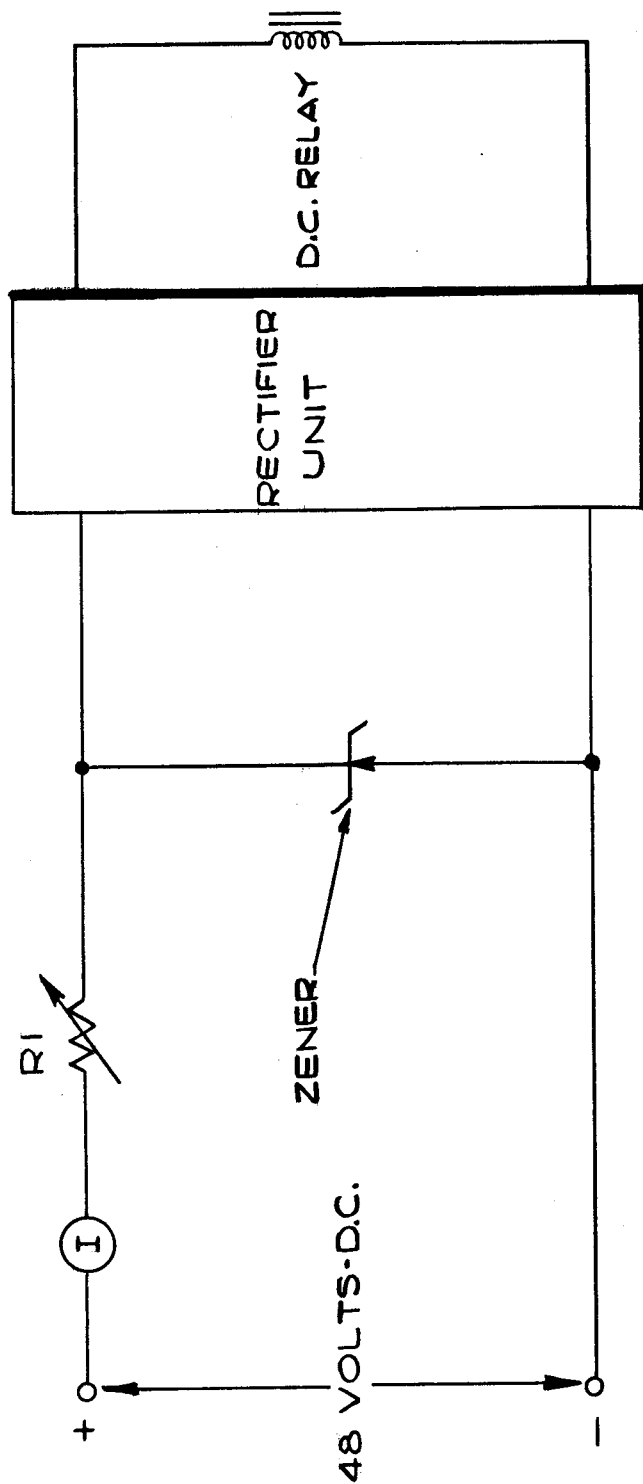


FIG. 3

WITH 48 V.D.C. APPLIED AND  
 R1 SET FOR 30 TO 120 MA,  
 THE RELAY SHALL OPERATE  
 AND THE ZENER DIODE SHALL  
 NOT BE OVERLOADED.



